



Sustainability Program: PV in Our Energy Future

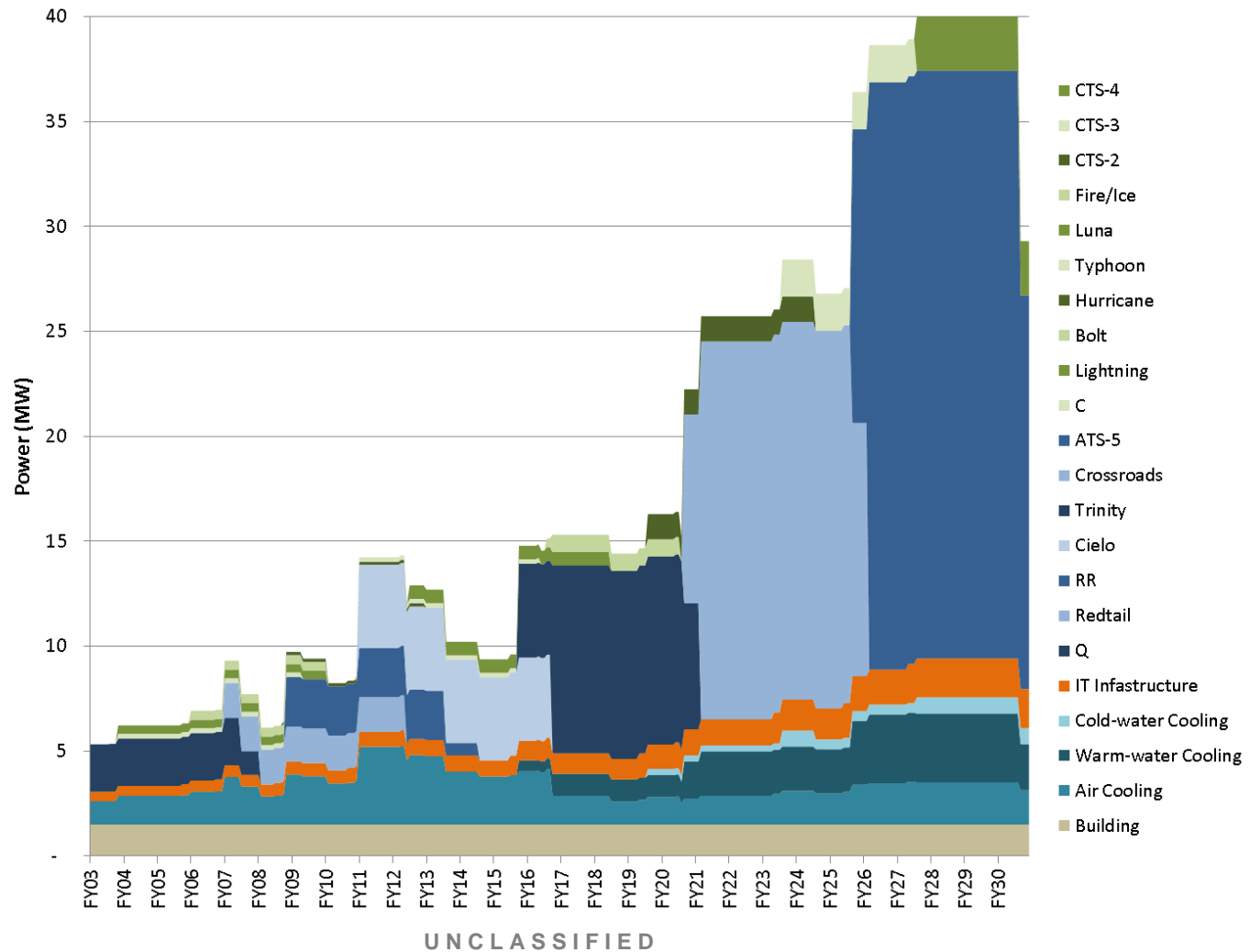
Monica Witt, Laboratory Sustainability Officer

October, 2016

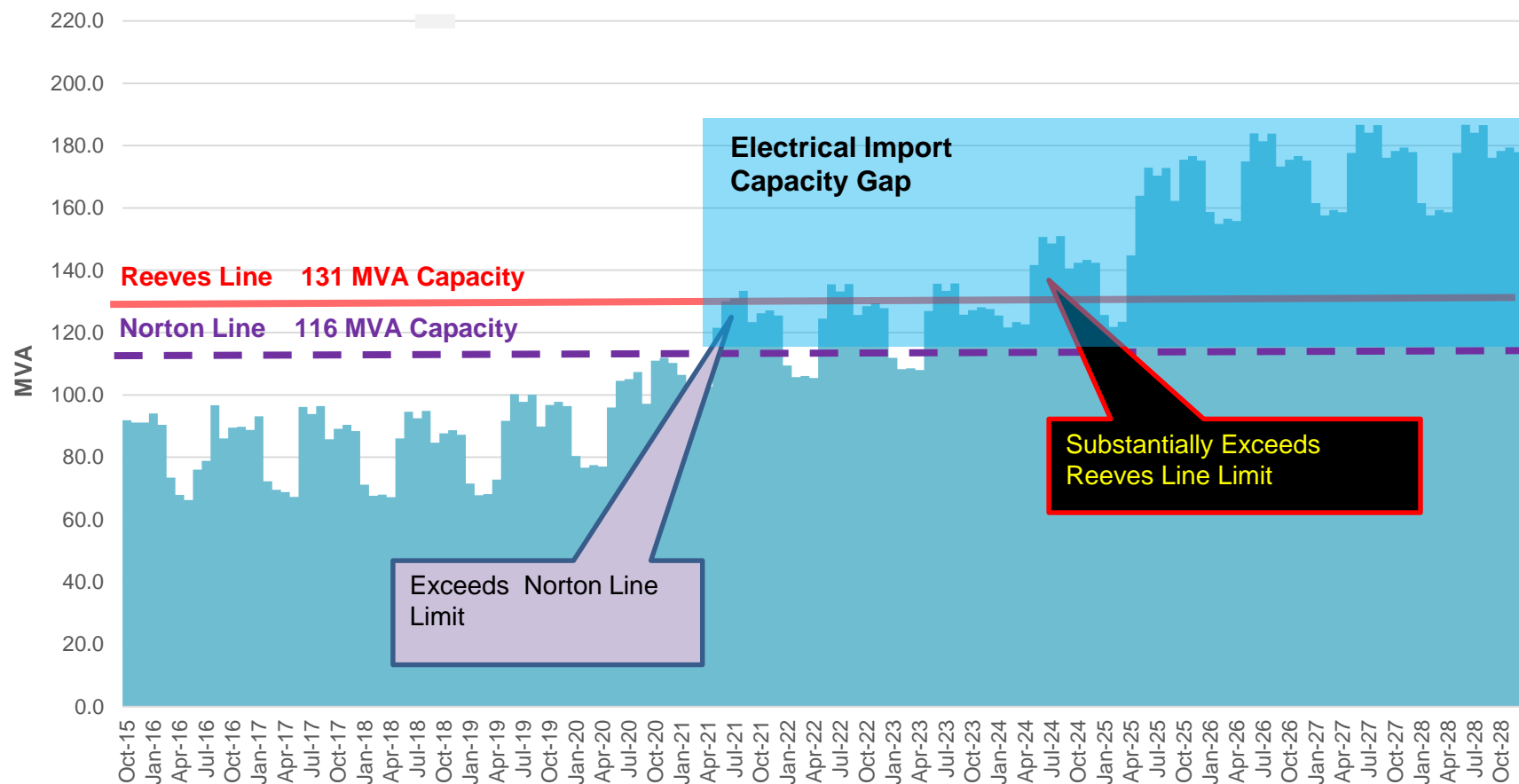
Solar Power Purchase Agreement Proposal

- Need for on-site power production
- What is a power purchase agreement
- PPA successes across the country and the federal government
- Two previous DOE funded Photovoltaic (PV, aka “Solar”) feasibility studies for LANL
- Potential scope of work, LANS management approval

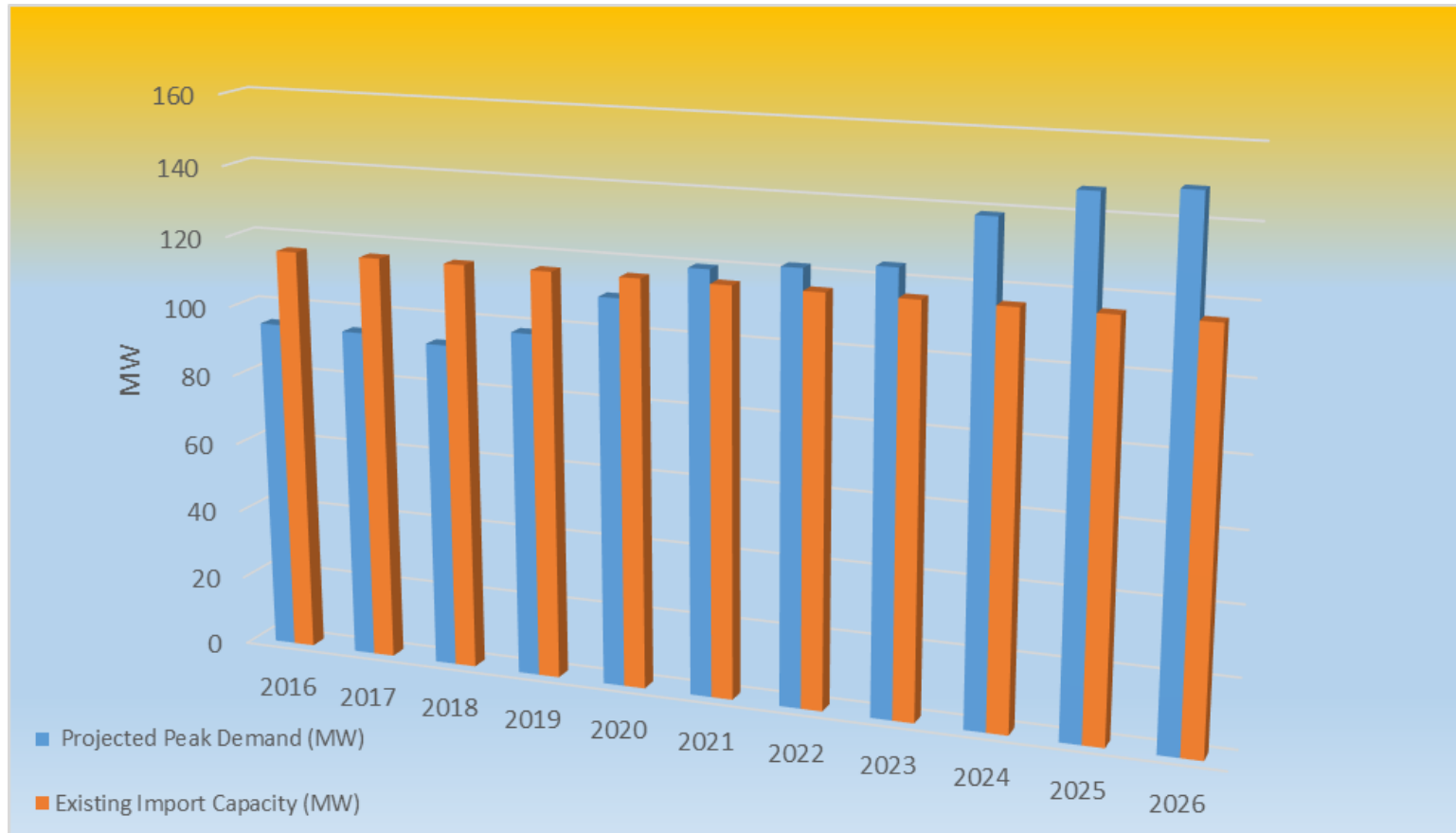
Peak power estimates for the SCC



Los Alamos Power Pool Electrical Power Forecast



Simply, our demand exceeds import capacity

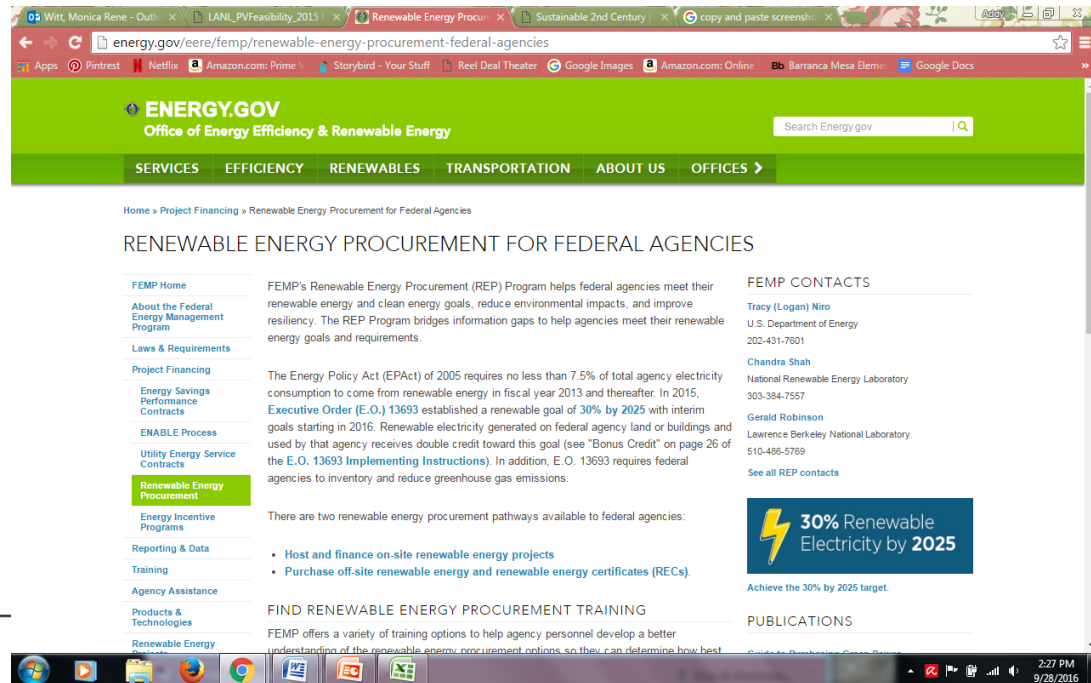


Why Renewable Energy, Why PV?

- New Executive Order **13693** - Planning for Federal Sustainability in the Next Decade
 - Reduce Scope 1&2 Greenhouse Gas emissions by 50% by FY2025 compared to a FY2008 baseline.
 - Ensure that at a minimum, not less than 30% by FY2025 and each year thereafter of the total amount of building electric energy consumed by the agency, is renewable electric energy.
- Timeframe to enable LANL to support HPC growth, compete for future mission
- Falling prices, flexible financing, and market maturity

What is a Power Purchase Agreement (PPA)?

- A developer installs a renewable energy system on federal land or buildings. In exchange, the agency agrees to purchase the power generated by the system. These power purchase payments repay the developer over the contract term. The developer owns, operates, and maintains the system for the life of the contract.



PV PPA Successes across the Country

PPAs were used to fund these federal on-site renewable energy projects:

- 14.2 MW PV at Nellis Air Force Base
- 2 MW PV at U.S. Army Fort Carson
- 2.3 MW PV at NREL
- 3.3 MW PV at LLNL



UC Davis 16.3 MW PV System

- 62-acre plot on the south end of campus is now generating 14% of UC Davis' electricity.
- 16.3 MW SunPower solar power plant, which will reduce the university's carbon footprint by 9%.



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Slide 9

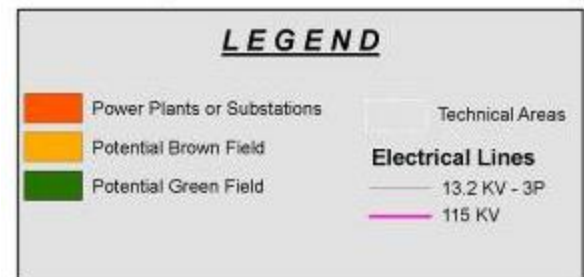
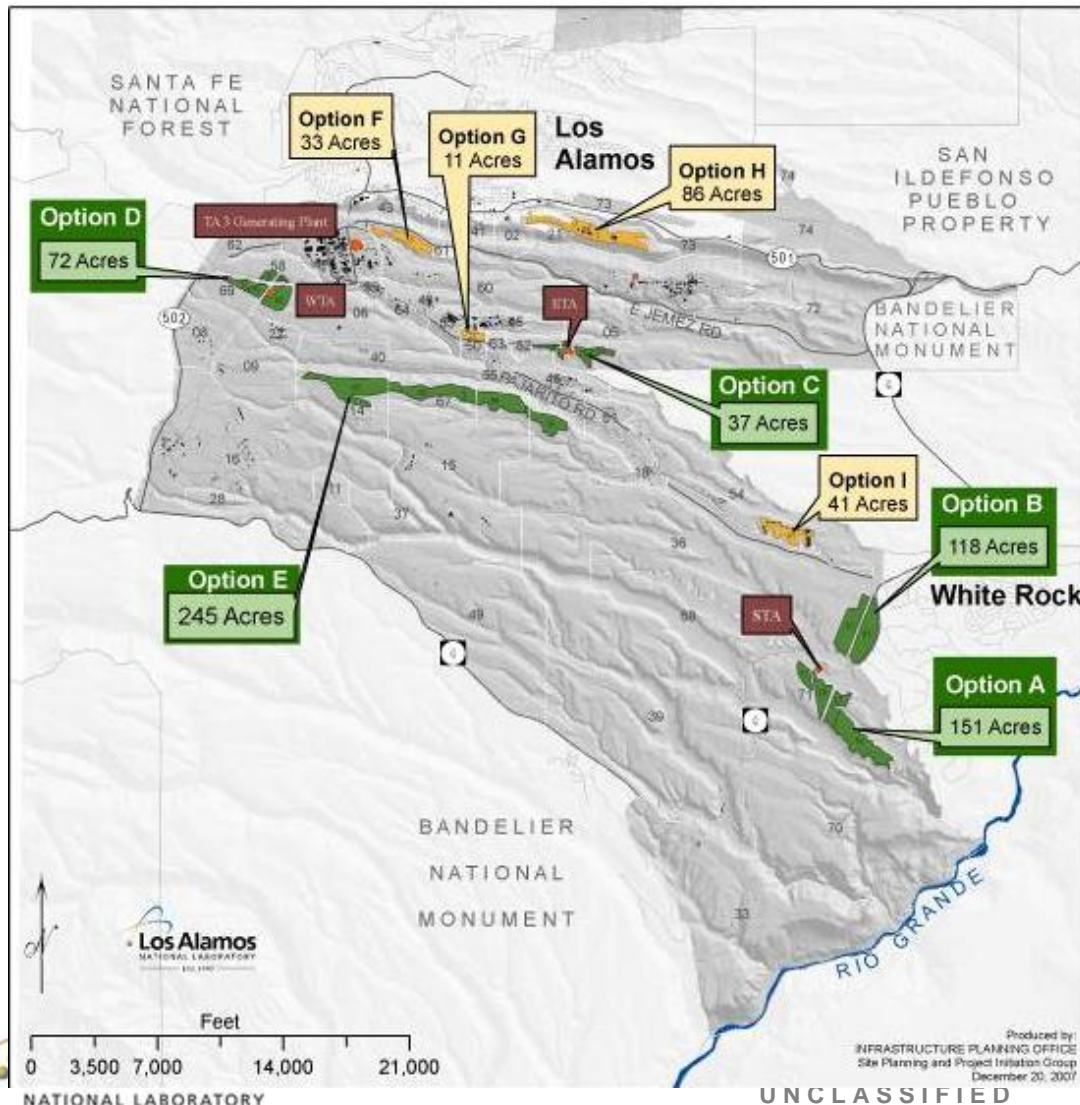
2008 Renewable Energy Feasibility Study

- 2008, authored by NREL and funded by DOE: the purpose of this visit was to determine the potential for PV installations at the LANL site. The entire campus was considered in this analysis, and many potential system locations were identified: 9 different ground mount locations with total available land up to 1,000 acres (500 usable acres), 5 roof-mounted systems on 5 buildings totaling up to approximately 110,000 ft² of available roof area.

2015 LANL Solar Economic Analysis update

- 2015 update, authored by NREL and funded by DOE: The economic analysis of the original 2008 study was updated in 2015 for four of the nine proposed ground mount locations with up to date electricity costs, incentives, and photovoltaic installed costs. The four ground mount locations were identified as being the best candidates from a siting and environmental perspective.
- 4 different ground mount locations with total available land up to 406 usable acres. The installed capacity could be as large as 58.6 MW.

Potential Land Parcels for PV Installation



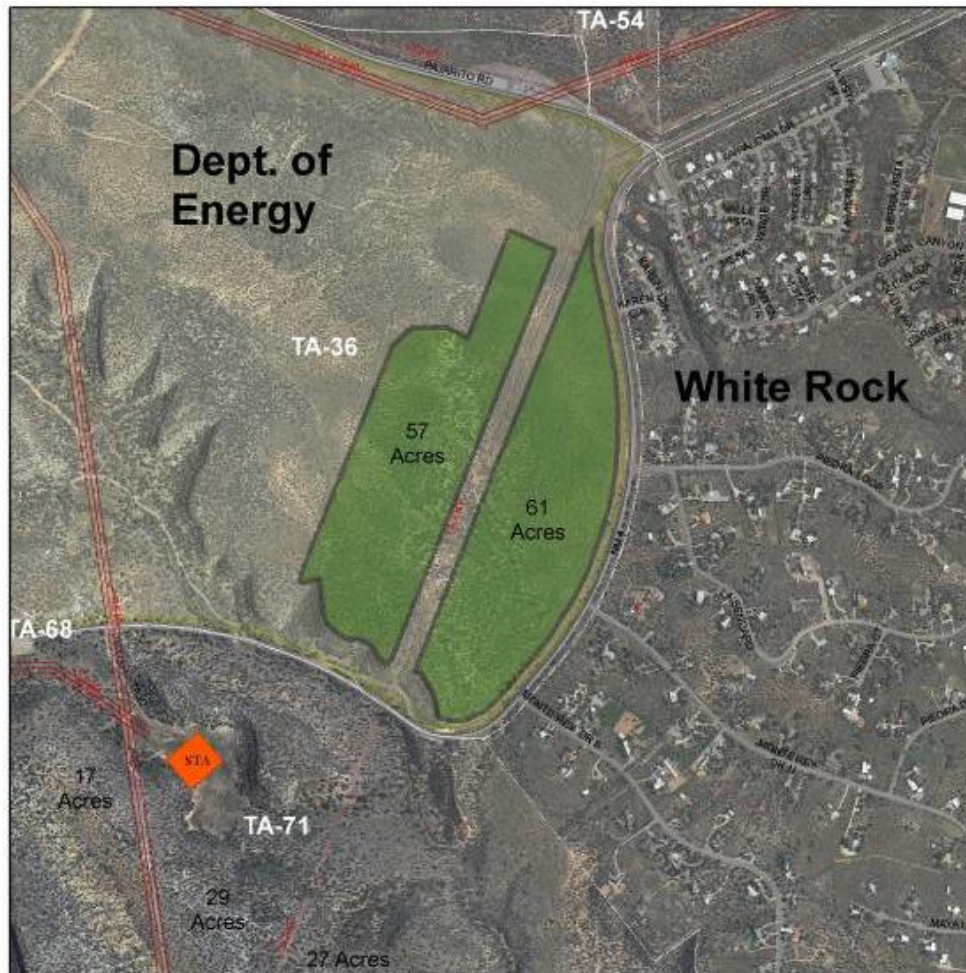
Economics by Parcel

Metric	Parcel A	Parcel B	Parcel C	Parcel D
System Size (kW)	29,447	19,863	8,712	12,720
Installed Cost (\$)	\$44,170,500	\$29,794,500	\$13,068,000	\$19,080,000
Annual Energy Prod. (kWh)	37,952,416	25,600,190	11,228,357	16,394,020
Energy Cost Savings (\$/yr)	\$2,312,441	\$1,559,820	\$0	\$998,888

Parcel B – 114 total acres

- Parcel B is made up of 2 available sublots just east of White Rock and just west of NM State Road 4. A 13.2 kV 3P power line runs down the middle of both available sublots. A 56 acre lot to the northwest side of the power line and a 58 acre lot to the southwest of the power line. Vegetation is pinion-juniper. Archeological sites are present on these sublots. These lots lie within the property protection area of the Laboratory in TA-36.

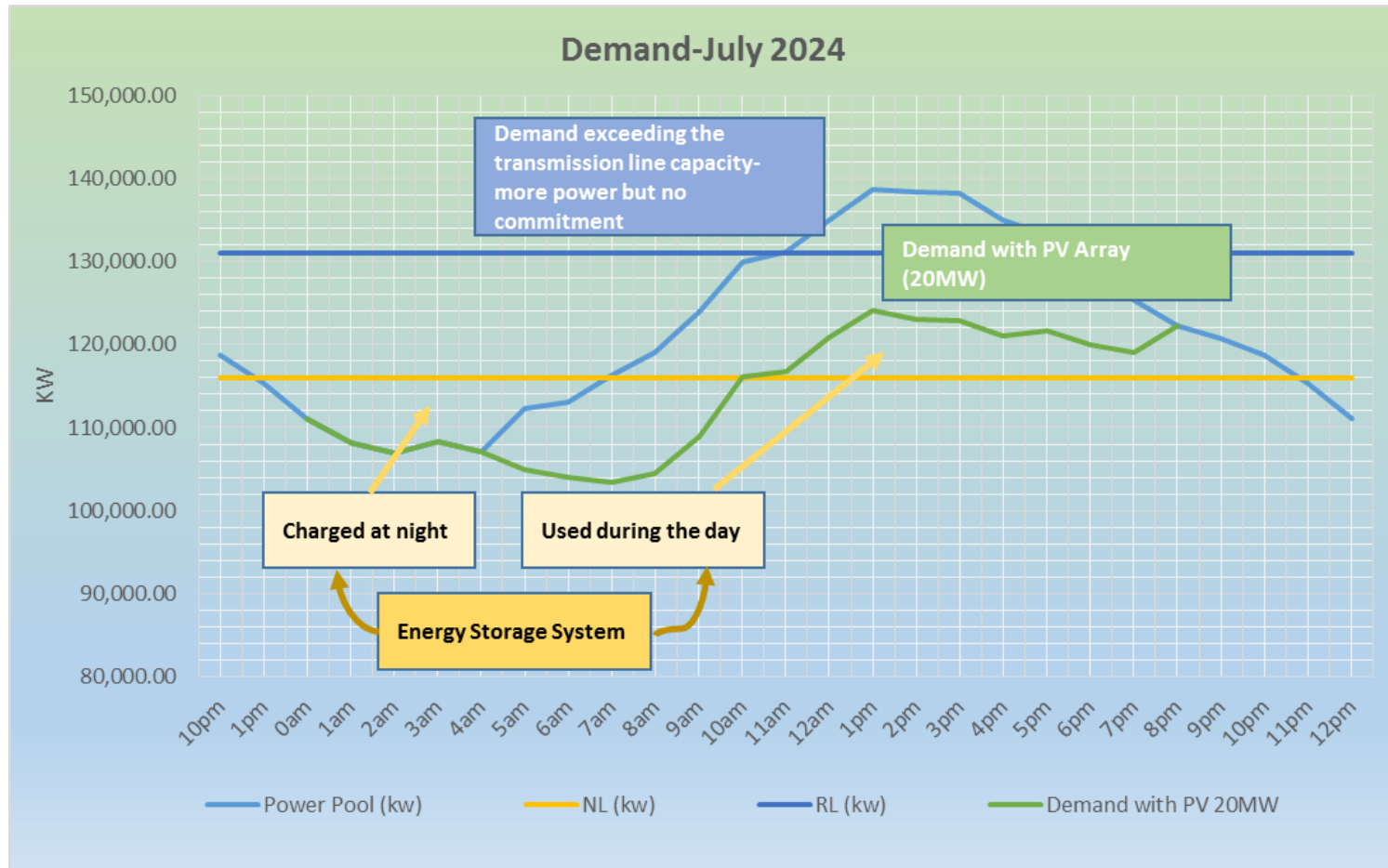
Parcel B Map



Option B Solar Array Lot



PV Array and Energy Storage System



Scope 1 and 2 GHG emissions Projections

Need variety of generation sources to meet 50% GHG reduction goal by FY 2025, *if HPC grows as anticipated.*

- Small Modular Reactor with Idaho National Laboratory and UAMPS
- 120 MW of wind power with natural gas backup
- 20 MW onsite PV battery storage

Summary and Questions?

- LANL Principal Associate Director of Operations and the Utilities Division is ready to move forward with a 10 MW PV PPA to support Lab mission growth and reduce GHG emissions to meet the DOE sustainability goals.
- LANL can position itself as a leader in DOE with the largest PV installation.
- LANL's energy opportunities are exciting and the timing is critical.

Back up slides

Economic Analysis

- The Solar Advisor Model (SAM) model was used for this analysis.⁷ The system size, installed cost, annual energy production, and energy cost savings of a ground mount fixed tilt and ground mount single axis tracking system were analyzed at all four locations
- The NREL report concluded that the first year PPA price for the proposed single axis tracking system is very close to the estimated 2018 electric rate and the PPA is assumed to escalate at the same 2.65% as the electric grid. This indicates that a PV system will be very competitive with grid purchased electricity in 2018

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- Include economic chart and table from report